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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/692,367	10/22/2003	Mathis L. Muller	2119-4280	2297

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EXAMINER	
IBRAHIM, MEDINA AHMED	
ART UNIT	**PAPER NUMBER**
1638	

DATE MAILED: 06/17/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/692,367	MULLER ET AL.	
	Examiner	Art Unit	
	Medina A. Ibrahim	1638	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 March 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16 and 27-55* is/are pending in the application.

4a) Of the above claim(s) *4-6,35-37,44-46 and 53-55* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,7-16,27-34,38-43 and 47-52* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicant's election with traverse of Group I, claims 1-16 and 27-55 and SEQ ID NO: 11-12, in the reply filed on 05/03/05 is acknowledged. The traversal is on the ground(s) that Applicant submits that the nucleic acid molecule encoding SEQ ID NO: 24, 30, 34, 38, 46, 48, 60, 62, 66 and 72 can be examined with the nucleic acid molecule encoding SEQ ID NO: 12 with no additional search because SEQ ID NO: 12 shares 92%-99% sequence identity with SEQ ID NO: 24, 30, 34, 38, 46, 48, 60, 62, 66 and 72. This is not found persuasive because while the search of SEQ ID NO: 11-12 may reveal sequences having at least 91% identity thereof which include nucleic acid sequences encoding SEQ ID NO: 24, 30, 34, 38, 46, 48, 60, 62, 66 and 72; the search results of SEQ ID NO: 11-12 cannot be used to determine the patentability of any of the other sequences. Therefore, each sequence has to be searched separately. Furthermore, the search includes both commercial and patent (including pending) databases. Therefore, searching nucleic acid molecules encoding SEQ ID NO: 12, 24, 30, 34, 38, 46, 48, 60, 62, 66 and 72 and variants thereof in a single application would create serious search burden upon the Office. In addition, since each nucleic acid molecule or polypeptide sequence has been disclosed with specific SEQ ID NO, the structural different between the nucleic acid molecules (or the polypeptide sequences) has not been shown to obvious over each other. Also, Applicant has not shown that any of the non-elected sequences (nucleic acid molecule/ polypeptides) relate to SEQ ID NO: 11-12 as a fragment/portion. Absent a showing that the structural differences

between different nucleic acids or polypeptides would have been obvious and that different sequences are not patentable over each, the requirement may be maintained. The requirement is still deemed proper and is therefore made FINAL.

Claims 1-16 and 27-55 are pending.

Claims 1-3, 7-16, 27-34, 38-43, 47-52, drawn to SEQ ID NO: 11 and nucleic acid molecules encoding SEQ ID NO: 12 are considered. SEQ ID NO: 1, drawn to the maize wild type chitinase, will also be considered.

Claims 4-6, 35-37, 44-46 and 53-55, drawn to non-elected invention (sequences) have been withdrawn from consideration.

Claim Objections

Claims 1, 7, 10, 14, 27, 31, 38, 41, 47, and 50 are objected to for reciting non-elected inventions (SEQ ID NO:). The claims should be amended accordingly.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-3, 7-16, 27-34, 38-43, 47-52, are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for the isolated nucleic acid comprising SEQ ID NO: 11 encoding SEQ ID NO: 12 having improved chitinase activity as compared to the wild-type maize chitinase of SEQ ID NO: 1, a vector comprising said nucleic acid, does not reasonably provide enablement for an isolated nucleic acid encoding a chitinase having at least 91% sequence identity to SEQ ID NO: 12, a

polynucleotide sequence that hybridizes to SEQ ID NO: 11 and that does not encode SEQ ID NO: 1, 2, 17, 18, 19, or 20 SEQ ID NO: 11, and wherein the polypeptide exhibits a chitinase activity of at least 20% or 200% of the maize chitinase of SEQ ID NO: 1, a vector comprising said polynucleotide, a plant comprising said nucleic acid, and a method of enhancing fungus resistance with said polynucleotide . The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention commensurate in scope with these claims.

The claims are broadly drawn to an isolated nucleic acid comprising a polynucleotide encoding a chitinase polypeptide having at least 91% sequence identity to SEQ ID NO: 12, wherein the chitinase polypeptide exhibits chitinase activity of at least 20% or 200% of the chitinase activity of SEQ ID NO: 1, and a nucleic acid comprising a polynucleotide that hybridizes to SEQ ID NO: 11 at specified wash conditions, with the proviso that polynucleotide does not encode SEQ ID NO: 1, 2, 17, 18, 19 or 20, and wherein the chitinase polypeptide exhibits chitinase activity of at least 20% or 200% of the chitinase activity of SEQ ID NO: 1. The claims are also drawn to a plant comprising a recombinant expression cassette comprising a promoter operably linked to said polynucleotide, and a method for transforming a plant with said recombinant expression cassette to enhance fungal and nematode resistance. The claims are further drawn to said method, wherein the plant is maize or soybean and wherein the fungus and nematode are from the genus *Fusarium* and *Heterodera*, respectively.

Applicant teaches identification of chitinase clones having improved chitinase activity and isolation of the polynucleotide of SEQ ID NO: 11 encoding SEQ ID NO: 12 having improved chitinase activity as compared to the wild-type chitinase maize of SEQ ID NO: 1 (Example 1), sequence relationship between SEQ ID NO: 1 and 12 and other improved sequences (Figure 2). Applicant also teaches methods for in vitro testing of clones with enhanced chitinase activity for their ability to prevent hyphal growth of the pathogenic fungus Fusarium monilforme (Example 3), and shows that forty percent inhibition of hyphal growth was achieved with a 4-fold lower concentration of the SEQ ID NO12, as compared to SEQ ID NO: 1 (Figure 1). Applicant also teaches identification of additional clones with improved antifungal chitinase activity as compared to SEQ ID NO: 1 (Examples 4-5 and Tables 4-6). At Example 6, Applicant teaches methods for testing anti- nematode activity of the chitinase clones, SEQ ID NO: 1 and 12, using C. elegans. (Table 7), and effects of heat denaturation on the activity of the clones. The results in Table 9 show that the wild-type chitinase of SEQ ID NO: 1 exhibits no inhibitory effect on the development of C. elegans, while the chitinase SEQ ID NO: 12 and the chitinase SEQ ID NO: 56 are both inhibitory at concentrations of 9 ug/ml and 45 ug/ml. Applicant further teaches prophetic plant transformation and regeneration methods (Examples 7-10).

Applicant, however, does not teach expression of any of the disclosed nucleic acids in a transgenic plant and the use of the nucleic acids as broadly claimed for enhanced fungal and nematode resistance in transgenic plants. Applicant has not taught nucleic acids, other than SEQ ID NO: 11, encoding a polypeptide having

chitinase activity of at least 200% of SEQ ID NO: 1 having antifungal or anti- nematode activity. It is unclear as to whether a nucleic acid encoding a polypeptide having chitinase activity of 20% of SEQ ID NO: 1 is sufficient to induce antifungal or anti-nematode resistance in a transgenic plant. While the specification discloses nucleic acids encoding a polypeptide having at least 91% sequence to SEQ ID NO: 12, no guidance has provided regarding any antifungal or anti-nematode activity by said sequences. Applicant has not taught the regions of the full-length SEQ ID NO: 11-12 that are required for improved chitinase activity that is at least 200% of the chitinase activity of SEQ ID NO: 1. Applicant has not taught that all nucleic acids that hybridize to SEQ ID NO: 11 are capable of providing protection against plant fungal and nematode pathogens.

In *re Wands, 858F.2d 731, 8 USPQ2d 1400 (Fed. Cir. 1988)* lists a number of factors for determining whether or not undue experimentation would be required by one skilled in the art to make and use the invention. These factors are: the quantity of experimentation necessary, the amount of direction or guidance presented, the presence or absence of working examples of the invention, the nature of the invention, the state of the prior art, the relative skill of those in the art, the predictability or unpredictability of the art, and the breadth of the claims.

While mutagenesis techniques are known, it is not routine in the art to screen for multiple substitutions or multiple modifications as encompassed by the instant claims. One skilled in the art would expect any tolerance to modification for a given DNA to diminish with each further and additional modification or multiple substitutions/

deletions. One skilled in the art would have to make all possible nucleotide substitutions and deletions in SEQ ID NO: 11, and test all nucleic acids that meet the structural limitation to determine which also meet the functional limitation. One would also have to evaluate the chitinase activity of all nucleic acids encoding a chitinase having at least 91% sequence identity to SEQ ID NO: 12, and nucleic acids that hybridize to SEQ ID NO: 11, to determine those with at least 20% and 200% of the chitinase activity of SEQ ID NO: 1. One would also have to determine the ability of each said nucleic acids, through the myriad of transgenic plants transformed with each of said nucleic acids, to confer resistance against nematode and fungal pathogens.

Cornelissen et al (US 5, 670, 706) discuss the fungal resistance activity by hydrolytic enzymes as follows: "(L) ittle is known about the effect of hydrolytic enzymes on fungi in the biotrope, i.e., in the soil or on plant leaves, and although some of these enzymes are putative candidates for a role in fungal resistance, evidently, not all chitinases have activity against living fungi" (column 3, lines 22-26). In column 5, lines 29-34, the cited reference states "it seems at least doubtful that any chitinase can confer broad range protection of plants against phytopathogenic fungi. Generally, it is even questionable if chitinases by themselves are capable of providing sufficient protection against a broad range of plant pathogenic fungi".

In addition, the working examples disclosed in the specification is limited to an in vitro use of SEQ ID NO: 11 against specific fungus and nematode pathogens, and no transgenic plant with resistance against fungus or nematode as a result of expressing exemplified or non-exemplified nucleic acids has been disclosed.

Therefore, given the lack of guidance in the specification , lack of working example regarding transgenic plants, the state of the prior art, the nature of the invention, and the unpredictability as discussed above, the claimed invention is not enabled throughout the broad scope.

Written Description

Claims 1-3, 14-16, 31-34, 41-43, and 50-52 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The claims are broadly drawn to an isolated nucleic acid comprising a polynucleotide encoding a chitinase polypeptide having at least 91% sequence identity to SEQ ID NO: 12, wherein the chitinase polypeptide exhibits chitinase activity of at least 20% or 200% of the chitinase activity of SEQ ID NO: 1, and a nucleic acid comprising a polynucleotide that hybridizes to SEQ ID NO: 11 at specified wash conditions, with the proviso that polynucleotide does not encode SEQ ID NO: 1, 2, 17, 18, 19 or 20, and wherein the chitinase polypeptide exhibits chitinase activity of at least 20% or 200% of the chitinase activity of SEQ ID NO: 1. The claims are also drawn to a plant comprising a recombinant expression cassette comprising a promoter operably linked to said polynucleotide, and a method for transforming a plant with said recombinant expression cassette to enhance fungal and nematode resistance. The claims are further drawn to said method, wherein the plant is maize or soybean and

wherein the fungus and nematode are from the genus *Fusarium* and *Heterodera*, respectively. In contrast, Applicant describes SEQ ID NO: 11 encoding SEQ ID NO: 12, and a vector comprising said nucleic acids.

University of California v. Eli Lilly and Co. 43 USPQ2d 1398 (Fed. Cir. 1997) where it states "A description of a genus of cDNA may be achieved by means of a recitation of a representative number of cDNAs, defined by nucleotide sequence, falling within the scope of the genus or of a recitation of structural features common to members of the genus, which features constitute a substantial portion of the genus. See also where the court teaches that the disclosure of a process for obtaining cDNA from a particular organism and the description of the encoded protein fail to provide an adequate written description of the actual cDNA from the organism which would encode the protein from that organism, despite the disclosure of a cDNA encoding that protein from another organism. See, also Written description Examination Guidelines published in Federal Registry/Vol. 66, No.4/Friday, January 5, 2001/Notices).

Applicant has not described a representative number of nucleic acids having both structural and functional properties as recited in the claims because structural property (% of identity and hybridization) cannot predict the function of the polypeptide encoded by the said nucleic acids. Since Applicant has not described the nucleotide sequences of the invention as broadly claimed, vectors, plant/ cells comprising said nucleic acids, and a method of using said nucleic acids are similarly not described. Given this lack of description of representative species encompassed by the genus of the claims, the specification fails to sufficiently describe the claimed invention in such full, clear,

concise, and exact terms that a skilled artisan would recognize that Applicant was in possession of the invention as broadly claimed at the time of filing.

Therefore, weighing all factors above, the claimed invention does not meet the current written description requirements.

Remarks

Claims 14-16 and 47-52 are deemed free of the prior art of record.

No claim is allowed.

Contact information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Medina A. Ibrahim whose telephone number is (571) 272-0797. The Examiner can normally be reached Monday -Thursday from 8:00AM to 5:30PM and every other Friday from 9:00AM to 5:00 PM. Before and after final responses should be directed to fax nos. (703) 872-9306 and (703) 872-9307, respectively.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Dr. Amy Nelson, can be reached at (571) 272-0804.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

For all other customer support, please call the USPTO Call Center (UCC) at 800-786-9199.

Mai

6/7/05

Medina A. Ibrahim

MEDINA A. IBRAHIM
PATENT EXAMINER